Teaching Philosophy

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November 6, 2019

I was sitting in my office on a sunny July afternoon when Leah[1] told me, "I prefer math... I'm really more of a math person." She may not have realized it, but that signaled a significant change in her mindset.

We met seven months earlier when she was a student in my differential equations class. After I administered a prerequisite test, she was one of the students I contacted who demonstrated some gaps in her prior knowledge. When we met, she told me, "I'm just not a math person."

My philosophy is that everyone is a math person. Mathematics is just a formalization of how humans solve quantitative problems. I explained to Leah that struggling in a past math class did not mean she could not do math well. It did mean, however, is that she had some gaps in her knowledge that will require extra work.

I communicate two beliefs to my students: (1) math is learned through practice and (2) mistakes are an important part of that practice. During the first lecture of every class I teach, I summarize my philosophy on learning mathematics and discuss how that it informs my classroom policies. I assign homework after every lecture, provide thorough and encouraging feedback, and give students an opportunity to revise their work. Because my homework assignments often include questions from prior topics, students are given many opportunities to hone their knowledge throughout the course.

There are many ways to setup such a classroom structure, but as someone particularly concerned with increasing diversity in mathematics, it is a priority to me that I create a system that works for a variety of students facing different difficulties. Explicitly, I try to accommodate students who

1. don't want to be anonymous,
2. do well with structure and consistency,
3. enjoy learning in a collaborative environment,
4. need to dismantle their fear of making a mistake,
5. work multiple jobs while going to school, and
6. struggle to afford their textbooks.

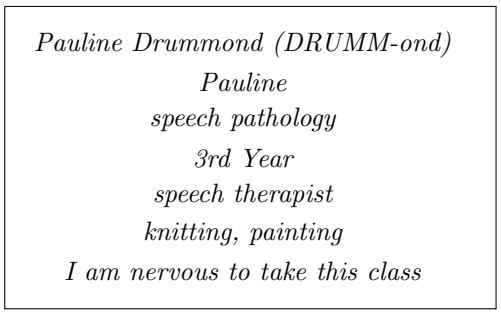
Pauline Drummond (DRUMM-ond)
Pauline
speech pathology
3rd Year
speech therapist
knitting, painting
I am nervous to take this class

Figure 1: I ask students to fill out an index card with their full name, a pronunciation guide, a preferred nickname (if applicable), major, year, target career, hobbies, and anything else that would like me to know (such a pronouns or math anxiety).

I address these issues in the following ways:

1. **I learn my students' names.** I believe anonymity can be detrimental in the classroom. Students should be acknowledged as individuals and I try to do that, starting with learning their name (see Figure 1). Even after the course is over, I say hello when I see a former student around campus and try to catch up with them.
2. **I assign challenging homework based directly on objectives, I give thorough feedback, and I allow students to fix any issues.** I believe assignments should be part of an educational loop. It's an opportunity for students to test their understanding of a concept in class. When they get a problem wrong, it's important that they understand what precisely is the problem. And opportunity to fix this is a way for me to check that their understanding has improved from the feedback.

[1]The student's name has been changed to protect her privacy.

3. **I reference the ideas of my students to foster a collaborative environment.** When we discuss problems, I will say phrases like, "Let's use Duane's idea," or "Shaoming made a great suggestion." This incentivizes creative thinking, makes lectures feel more like a group effort, and helps students know each other better. Within a few weeks, students generally know each other by name and start to collaborate without my prompting. More importantly, I do not curve. Students should not compete and grades should reflect absolute knowledge (based on specified objectives), not relative performance.

4. **I avoid quizzes altogether.** Homework can be practiced when a student is intellectually prepared for the material. For students who work, this can make a huge difference. The demands of their jobs can often spill over into their academic life, disrupting their sleep and schedules. Midterms and finals, which are set far in advance, give students an opportunity to adjust their work schedules accordingly. Quizzes, however, generally aren't. Moreover, there is little evidence in the literature to suggest that quizzes are superior to homework assignments.

5. **I do not rely on a textbook or I follow one that is very affordable.** I generally prefer to write my own lecture notes, which keeps students' costs lower. This also keeps me accountable by forcing me to document what I have and have not covered.

My goal is to create an inclusive classroom where all students are provided with the resources, guidance, and support needed to excel. While my student reviews suggest that these methods are effective, I am always making adjustments to better address my students needs. These adjustments are largely informed by the feedback I collect from students as well as published research in education. After the first midterm, I send out an anonymous survey to help assess my students experience. If I notice an issue that I have never encountered before or that does not have a straightforward solution, I often seek out published research or I will email math education researchers directly for some advice. Whenever possible, I prefer to follow evidence-based approaches. In that vain, I have taken education courses at Penn State (under Kathleen Heid), at Stanford (under Jo Boaler), and at UC San Diego (under Barbara Oakley and Terrence Sejnowski) as well as a handful of courses in psychology, sociology, and neuroscience.

As a result of my training, I have numerous teaching-related ambitions. Chief among them is to create more free, online educational content and, eventually, create MOOC based on a book I co-authored, Mathematics for Sustainability. I also am interested in running rigorous, computation-based and collaborative REUs where students actively solve an open problem relevant to the community. Finally, I am very interested in advising an academic student group where I can incorporate preparatory activities for graduate school.

I take teaching very seriously; it might be one of the most impactful things I ever do. While any one class might be just a semester of my life, for my students it can mean an entirely new way of seeing themselves. In Leah's case, she became a successful civil engineer who now works in Philadelphia. Not bad for someone who used to say she wasn't a math person!

Some Student Review Data

Summary Data

- **Differential Equations, Spring 2013, Penn State University**

Response rate	Instructor Overall Rating	Clarity	Positive Atmosphere
63.04%	6.69 / 7	6.45 / 7	6.83 / 7

- **Trigonometry, Fall 2014, Penn State University**

Response rate	Instructor Overall Rating	Clarity	Positive Atmosphere
71.7%	6.55 / 7	6.42 / 7	6.70 / 7

- **Calculus of Several Variables, Summer 2014, Penn State University**

Response rate	Instructor Overall Rating	Clarity	Positive Atmosphere
42.9%	6.78 / 7	6.89 / 7	7 / 7

- **Statistical Learning, Fall 2018, IIT**

Response rate	Instructor Overall Rating	Enthusiasm	Accessibility
54 %	4.3 / 5	2.86 / 3	2.91 / 3

- **Calculus of Several Variables (2 sections), Spring 2019, Illinois Tech University**

Response rate	Instructor Overall Rating	Enthusiasm	Accessibility
85%	4.5 / 5	3 / 3	2.83 / 3

Response rate	Instructor Overall Rating	Enthusiasm	Accessibility
88%	4.48 / 5	2.86 / 3	2.77 / 3

Recent Student Comments

- *I really like Sara's teaching style. She was very thorough with the content and made sure that we understood the concept from the base. I really enjoyed doing her assignment. They not only serve as a guideline for the method that is being covered but it build a more intuitive understanding of the methodology. She is very helpful and prompt in answering your queries and it's something I really admire about her.*

- *Fantastic lecturer, is clearly passionate about math and is not afraid of making mistakes or being corrected, which I appreciate. I enjoy her classes immensely.*

- *Quite possibly the best professor I have had at this school.[IIT] Nice, accommodating, helpful and extremely knowledgeable*

- *I felt that the notes and videos were helpful for the flipped classroom setup. However, I found that I understood the class much more when Dr. Zelenberg lectured or reviewed in class– she is really great at explaining topics!*

- *I wanted to thank you for everything you've done in the course of the semester - topology has truly been the most rewarding course I've taken at IIT, thanks largely to your dedication to teaching. Your feedback on assignments has been very helpful and insightful, and your approach to the class has really helped me learn the material when it felt a bit out of my comfort zone as someone who is not a math major.*

  Anyway, I just wanted to let you know that you likely have had much more of an impact on my career than you could imagine given how I don't know you very well. I've quite literally had the thought while taking this course, at several times, "Why didn't I major in math rather than physics? This is fun!" (although I'm very happy doing physics!).